CLAIMS

What is claimed is:

1. A 3-D fabric or preform for composites comprising:

a three-dimensional engineered fiber preform formed by intersecting yarn system components; and

at least one system, device, and/or network integrated with the preform for providing a predetermined function,

wherein the at least one system, device, and/or network is introduced prior to formation of a composite structure including the preform,

thereby providing a 3-D fabric preform for composites.

2. The preform according to claim 1, wherein the at least one system, device, and/or network is introduced at or during the fabric-forming process.

3. The preform according to claim 1, wherein the at least one system, device, and/or network is introduced after the fabric-forming process, but prior to the formation of the composite or other application of the fabric.

4. The preform according to claim 2, wherein the at least one system, device, and/or network is integrated with the preform while the preform is being formed on a machine.

5. The preform according to 1, wherein the at least one system, device, and/or network is automatically integrated with the preform.

6. The preform according to claim 1, wherein the at least one system, device, and/or network is manually integrated with the preform.

7. The preform according to claim 1, wherein the preform is formed from a 3-D woven fabric.

8. The preform according to claim 1, wherein the preform is formed from a 3-D orthogonally woven fabric.

9. The preform according to claim 1, wherein the preform is formed from a 3-D braided fabric.

10. The preform according to claim 1, wherein the preform is formed from a 3-D multiaxial fabric.

11. The preform according to claim 1, wherein the at least one system, device, and/or network includes at least one sensor.

12. The preform according to claim 11, wherein the at least one sensor is selected from the group consisting of fiber optic sensors, piezoelectric sensors, temperature sensors, pressure sensors, piezomagnetic sensors, electrically conductive sensors, hydraulic sensors, and combinations thereof, and combinations thereof.

13. The preform according to claim 1, wherein the at least one system, device, and/or network includes electrically conductive components.

14. The preform according to claim 1, wherein the components include electrically conductive components aimed at telecommunication, data transmission, electromagnetic reception, electromagnetic transmission, electromagnetic diffusion/diffraction, electromagnetic shielding of electronic equipment, personnel protection against electromgnetic radiation, and other similar functions which are distinct from the functions of sensing and actuation.

15. The preform according to claim 1, wherein the at least one system, device, and/or network includes at least one actuator.

16. The preform according to claim 1, wherein the at least one system, device, and/or network includes at least one transducer.

17. The preform according to claim 1, wherein the at least one system, device, and/or network includes at least one diagnostic system, device, or network.

18. The preform according to claim 17, wherein the at least one system, device, and/or network includes at least one fabric diagnostic system, device, or network.

19. The preform according to claim 1, wherein the at least one system, device, and/or network includes at least one magnetic component.

20. The preform according to claim 1, wherein the at least one system, device, and/or network includes at least one component for releasing a medication.

21. The preform according to claim 1, wherein the at least one system, device, and/or network includes at least one component for repairing the preform.

22. The preform according to claim 1, wherein the at least one system, device, and/or network includes at least one audio component.

23. The preform according to claim 1, wherein the at least one system, device, and/or network includes at least one video component.

24. The preform according to claim 1, wherein the at least one system, device, and/or network includes at least one receiver and/or transmitter components.

25. The preform according to claim 1, where the 3-D fabric or preform is to be used for its own purpose or without being included in further composite processes.

26. The preform according to claim 1, wherein the preform is formed from a 3-D multiaxial woven fabric incorporating more than three directions of fibers/tows, where at least one of them is oriented at an angle to the direction of fabric formation.

27. The preform according to claim 1 wherein the network forms a circuit for the transmission of fluids, electricity, or light.

28. The preform according to claim 1 wherein the network forms a circuit for the transmission of fluids, electricity, or light and which performs logical functions.

29. The preform according to claim 1, wherein the preform is formed from/as a 3-D warp-knitted fabric.

30. The preform according to claim 1, wherein the at least one system, device, and/or network includes at least one optical fiber.

31. The preform according to claim 1, wherein the at least one system, device, and/or network includes at least one piezoelectric fiber or other piezoelectric object substantially extended in one direction.

32. The preform according to claim 1, wherein the at least one system, device, and/or network includes at least one shape memory alloy fiber or other shape memory alloy object substantially extended in one direction.

33. The preform according to claim 1, wherein the at least one system, device, and/or network includes at least one tubular , hollow, or microchannel fiber, rod, or filament.

34. A method for forming a 3-D preform for composites comprising the steps of:

providing yarn system component for forming a three-dimensional engineered fiber preform formed by intersecting textile system components; and

providing at least one system, device, and/or network integrated with the preform for providing a predetermined function,

wherein the at least one system, device, and/or network is introduced prior to formation of a composite structure including the preform,

thereby providing a 3-D fabric preform for composites.

35. The method according to claim 34, further including the steps of:

introducing device/network materials to the textile processing system supply for integration with the preform in at least one fiber or pathway of the network materials; producing the preform via a textile processing system; thereby producing a 3-D fabric having integrated networks/devices therein.

36. The method according to claim 35, wherein the at least one fiber or pathway of the network materials, device and/or sensors is a substantially straight pathway.

37. The method according to claim 35 wherein the at least one fiber or pathway is flexible.

38. The method according to claim 35 wherein the at least one fiber or pathway is rigid.

39. A polymer matrix composite material which is manufactured with the utilization of the preform according to claim 1 using any suitable room temperature or elevated temperature composite fabrication technique.

40. A ceramic matrix, metal matrix and/or carbon matrix composite material which is manufactured with the utilization of the preform according to claim 1 using any suitable processing technique, with the selection of the system, device, and/or network able to maintain its functionality in a respective high temperature processing and/or in-service environment.